

- 28 -

WHAT IS CLAIMED IS:

1. An acoustic agglomerator for agglomerating constituents, comprising:
an acoustic generator configured to communicate with
5 an area containing a fluid having constituents,
wherein the acoustic generator is operable to generate a frequency modulated acoustic field to enhance agglomeration of the constituents in the fluid.

10 2. The acoustic agglomerator of claim 1, wherein the fluid is further defined as a liquid.

15 3. The acoustic agglomerator of claim 1, wherein the fluid is further defined as a gas.

4. The acoustic agglomerator of claim 1, wherein the fluid is further defined as a combustion exhaust gas.

20 5. The acoustic agglomerator of claim 1, further comprising:
a second acoustic generator operable to generate a second acoustic field to enhance agglomeration of the constituents in the fluid.

25 6. The acoustic agglomerator of claim 5, wherein the second acoustic field is modulated.

30 7. The acoustic agglomerator of claim 5, wherein the second acoustic field is amplitude modulated.

- 29 -

8. The acoustic agglomerator of claim 5, wherein the second acoustic field is frequency modulated.

5 9. The acoustic agglomerator of claim 8, wherein the acoustic generator frequency modulates the acoustic field relative to a first frequency and the second acoustic generator frequency modulates the second acoustic field relative to a second frequency.

10

10. The acoustic agglomerator of claim 9, wherein the acoustic generator amplitude modulates the acoustic field, and the second acoustic generator amplitude modulates the second acoustic field.

15

11. The acoustic agglomerator of claim 5, wherein the second acoustic field is frequency and amplitude modulated.

20

12. The acoustic agglomerator of claim 1, further comprising:
a plurality of acoustic generators operable to generate a plurality of modulated acoustic fields to enhance agglomeration of the constituents in the fluid.

25

- 30 -

13. The acoustic agglomerator of claim 1, wherein the area is an exhaust duct, further comprising:
a plurality of acoustic generators operable to
generate a uniform modulated acoustic field along
the length of the exhaust duct to enhance
agglomeration of the constituents in the fluid.

14. The acoustic agglomerator of claim 1, further comprising:
a particle collection device to receive the fluid from
the area, the particle collection device operable to
remove at least a portion of the constituents from
the fluid.

15. The acoustic agglomerator of claim 14, wherein the particle collection device is a filter.

16. The acoustic agglomerator of claim 14, wherein the particle collection device is an electrostatic precipitator.

17. The acoustic agglomerator of claim 14, wherein the particle collection device is a baghouse.

18. The acoustic agglomerator of claim 14, wherein the particle collection device is a cyclone separator.

19. The acoustic agglomerator of claim 14, wherein the particle collection device is a gravitational settling chamber.

- 31 -

20. The acoustic agglomerator of Claim 14, further comprising
a hopper operably positioned to accumulate at least a
portion of the constituents removed from the fluid
by the particle collection device.
21. An acoustic agglomerator for agglomerating
constituents, comprising:
an acoustic generator configured to communicate with
an area containing a gas having constituents,
wherein the acoustic generator is operable to
generate a modulated acoustic field to enhance
agglomeration of the constituents in the gas.
22. The acoustic agglomerator of claim 13, wherein the
acoustic generator can generate an amplitude modulated
acoustic field.
23. The acoustic agglomerator of claim 13, wherein the
acoustic generator can generate a frequency modulated
acoustic field.
24. The acoustic agglomerator of claim 22, further
comprising:
a second acoustic generator operable to generate a
second modulated acoustic field to enhance
agglomeration of the constituents in the gas.

- 32 -

25. The acoustic agglomerator of claim 22, further comprising:
a plurality of acoustic generators operable to generate a plurality of modulated acoustic fields to enhance agglomeration of the constituents in the gas.

26. The acoustic agglomerator of claim 23, further comprising:
a second acoustic generator operable to generate a second modulated acoustic field to enhance agglomeration of the constituents in the gas.

27. The acoustic agglomerator of claim 23, further comprising:
a plurality of acoustic generators operable to generate a plurality of modulated acoustic fields to enhance agglomeration of the constituents in the gas.

28. The acoustic agglomerator of claim 13 further comprising:
a plurality of acoustic generators operable to generate a plurality of modulated acoustic fields to enhance agglomeration of the constituents in the gas.

29. The acoustic agglomerator of claim 28, wherein at least a first acoustic generator of the plurality of

- 33 -

acoustic generators can generate a frequency modulated acoustic field.

- 5 30. The acoustic agglomerator of claim 28, wherein at least a first acoustic generator of the plurality of acoustic generators can generate an amplitude modulated acoustic field.
- 10 31. The acoustic agglomerator of claim 28, wherein at least a first acoustic generator of the plurality of acoustic generators can generate a first acoustic field at a first frequency, and at least a second acoustic generator of the plurality of acoustic generators can generate a second acoustic field at a second frequency.
- 15 32. The acoustic agglomerator of claim 31, wherein the at least a first acoustic generator can modulate the first acoustic field relative to the first frequency, and the at least a second acoustic generator can modulate the second acoustic field relative to the second frequency.
- 20 33. The acoustic agglomerator of claim 32, wherein the at least a first acoustic generator can amplitude modulate the first acoustic field.
- 25

- 34 -

34. The acoustic agglomerator of claim 33, wherein the at least a second acoustic generator can amplitude modulate the second acoustic field.
- 5 35. The acoustic agglomerator of claim 28, wherein at least a first acoustic generator of the plurality of acoustic generators can generate a first acoustic field at a first amplitude, and at least a second acoustic generator of the plurality of acoustic generators can generate a second acoustic field at a second amplitude.
- 10
36. The acoustic agglomerator of Claim 13, further comprising:
- 15 a particle collection device to receive the gas from the area, the particle collection device operable to remove at least a portion of the constituents from the gas.
- 20 37. The acoustic agglomerator of claim 36, wherein the particle collection device is a filter.
38. The acoustic agglomerator of claim 36, wherein the particle collection device is an electrostatic precipitator.
- 25
39. The acoustic agglomerator of claim 36, wherein the particle collection device is a baghouse.

- 35 -

40. The acoustic agglomerator of claim 36, wherein the particle collection device is a cyclone separator.
41. The acoustic agglomerator of claim 36, wherein the particle collection device is a gravitational settling chamber.
42. The acoustic agglomerator of Claim 36, further comprising
a hopper operably positioned to accumulate at least a portion of the constituents removed from the gas by the particle collection device.
43. An acoustic agglomerator for agglomerating constituents, comprising:
an acoustic generator configured to communicate with a fluid having constituents, wherein the fluid is in an open area, and the acoustic generator is operable to generate an acoustic field to enhance agglomeration of the constituents in the fluid in the open area.
44. The acoustic agglomerator of claim 43, wherein at least a portion of the constituents are a biohazardous material.
45. The acoustic agglomerator of claim 43, wherein at least a portion of the constituents are chemicals.

- 36 -

46. The acoustic agglomerator of claim 43, wherein the open area is within a building.

47. The acoustic agglomerator of claim 43, wherein the acoustic generator can modulate the amplitude of the acoustic field.

48. The acoustic agglomerator of claim 43, wherein the acoustic generator can modulate the frequency of the acoustic field.

49. The acoustic agglomerator of claim 43, wherein the acoustic generator can modulate the frequency and amplitude of the acoustic field.

50. The acoustic agglomerator of claim 43, wherein the open area includes liquid.

51. The acoustic agglomerator of claim 43, wherein the open area includes gas.

52. An acoustic agglomerator for agglomerating constituents, comprising:
an acoustic generator configured to communicate with an exhaust of a vehicle having constituents, wherein the acoustic generator is operable to generate an acoustic field to enhance agglomeration of the constituents in the exhaust.

- 37 -

53. The acoustic agglomerator of claim 52, wherein the acoustic generator can modulate the amplitude of the acoustic field.

5

54. The acoustic agglomerator of claim 52, wherein the acoustic generator can modulate the frequency of the acoustic field.

10

55. The acoustic agglomerator of claim 52, wherein the acoustic generator can modulated the frequency and amplitude of the acoustic field.

15

56. The acoustic agglomerator of claim 52, wherein the exhaust includes combustion exhaust gas.

57. The acoustic agglomerator of claim 52, wherein the exhaust includes gas.

20

58. The acoustic agglomerator of claim 52, wherein the exhaust includes liquid.

25

59. An acoustic agglomerator for agglomerating constituents, comprising:
an acoustic generator configured to communicate with an area with a fluid flow having constituents, wherein the acoustic generator is operable to generate an acoustic field to enhance agglomeration of the constituents in the area, and

30

- 38 -

the acoustic generator applies the acoustic field to the area at an angle arbitrary to a direction of the fluid flow.

5 60. The acoustic agglomerator of claim 59, wherein the fluid flow includes liquid.

61. The acoustic agglomerator of claim 59, wherein the fluid flow includes gas.

10

62. The acoustic agglomerator of claim 59, wherein the fluid flow includes combustion gas particulate.

15

63. The acoustic agglomerator of claim 59, wherein the acoustic generator can modulate the amplitude of the acoustic field.

20

64. The acoustic agglomerator of claim 59, wherein the acoustic generator can modulate the frequency of the acoustic field.

25

65. The acoustic agglomerator of claim 59, wherein the acoustic generator can modulate the frequency and amplitude of the acoustic field.

30

66. An acoustic agglomerator for agglomerating constituents, comprising:
an acoustic generator configured to communicate with an area containing a fluid with constituents,
wherein the acoustic generator is operable to

- 39 -

generate an acoustic field to enhance agglomeration
of the constituents in the area; and
a system operable to determine information about the
constituents in the area, wherein
5 the acoustic generator can modify the acoustic field
in response to the information.

67. The acoustic agglomerator of claim 66, wherein the
system includes an opacity detector.

10 68. The acoustic agglomerator of claim 66, wherein the
system includes a particulate analyzer.

15 69. The acoustic agglomerator of claim 68, wherein the
system further includes an opacity detector.

70. The acoustic agglomerator of claim 66, wherein the
modification to the acoustic field is a modification
to the frequency of the acoustic field.

20 71. The acoustic agglomerator of claim 66, wherein the
modification to the acoustic field is a modulation of
the acoustic field.

25 72. The acoustic agglomerator of claim 71, wherein the
modulation is a frequency modulation.

73. The acoustic agglomerator of claim 71, wherein the
modulation is an amplitude modulation.

30

- 40 -

74. The acoustic agglomerator of claim 71, wherein the modulation is a combination of frequency and amplitude modulation.

5 75. The acoustic agglomerator of claim 66, wherein the acoustic field is modulated, and the modification to the acoustic field is a modification of the modulation.

10 76. The acoustic agglomerator of claim 75, wherein the acoustic field is frequency modulated.

77. The acoustic agglomerator of claim 75, wherein the acoustic field is amplitude modulated.

15

78. The acoustic agglomerator of claim 75, wherein the acoustic field is frequency and amplitude modulated.

20

79. The acoustic agglomerator of claim 78, wherein the modification is a modification of the frequency modulation.

25

80. The acoustic agglomerator of claim 78, wherein the modification is a modification of the amplitude modulation.

30

81. The acoustic agglomerator of claim 78, wherein the modification is a modification of both amplitude and frequency modulation.

- 41 -

82. The acoustic agglomerator of claim 66, wherein the modification to the acoustic field is a modification to the amplitude of the acoustic field.

5 83. A method of decreasing the frequency of cleaning a filtration device, the method comprising:
providing a filtration device, operable to filter a fluid stream having constituents;
applying an acoustic field to the fluid stream at a
10 point upstream of the filtration device, wherein the acoustic field enhances an agglomeration of the constituents.

15 84. The method of claim 83, wherein the acoustic field is frequency modulated.

85. The method of claim 83, wherein the acoustic field is amplitude modulated.

20 86. The method of claim 83, wherein the acoustic field is both frequency and amplitude modulated.

87. The method of claim 83, wherein the acoustic field is a sinusoidal sound field.

25 88. The method of claim 83, wherein the acoustic field is a periodic sound field.